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CALIFORNIA'S 1961 FIRE WEATHER BRINGS NEAR-RECORD LOSSES

Arthur R. Pirsko

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Weather conducive to severe fires brought near-record losses from fire damage to California in 1961. Disastrous blazes charred and blackened nearly a thousand homes and other structures located in wildland areas. The State also suffered the largest acreage loss in almost 40 years. Only once before--in 1924--did wildland fire damage in California exceed the 471,000 acres of forest, brush, and grassland burned in 1961.

The stage for this loss was set during the preceding winter rainy season. For the third straight year, most of the State, especially the central and southern parts, had well below normal precipitation (fig. 1). Such moisture shortages have a cumulative adverse effect on fuel characteristics. They reduce the amount of new green plant growth and increase the quantity of dead material, boosting the danger of fire. These changes were most noticeable in the southern brush fields. Low precipitation also affects the moisture content of the wildland fuels--both living and dead. Medium and heavy fuels were unusually dry at the start of the fire season.

Weather Patterns

A warming trend began in May 1961, and above-normal temperatures continued throughout the summer months. Associated with the warm weather was an upper level air-flow pattern in which a strong high-pressure ridge hovered over western North America. This affected the belt of westerlies and the jet-stream axis by pushing them far into northern Canada. With such an orientation of ridges and wind patterns, little frontal movement developed, and cool Pacific air masses could not penetrate.

In mid-June a combination of unusual weather features caused a blistering week-long heat wave in central California.[1/] First, the usual southwestern thermal low pressure extended into northern California. This movement brought in a light northerly surface flow of dry, adiabatically-warmed air to the central valley from the western interior. Next, along with the thermal low, a high pressure ridge aloft introduced warm air from the south and southwest. The subsiding air mass aloft increased its heat content and thereby left skies clear for maximum solar radiation to reach the earth. Air temperatures up to 115°F. were common and killed much of the spring plant growth to an elevation of 2,500 feet, drastically raising the fire danger.

1/ Ludlum, David L. Weatherwatch. Weatherwise 14(4):162-167, illus. 1961.

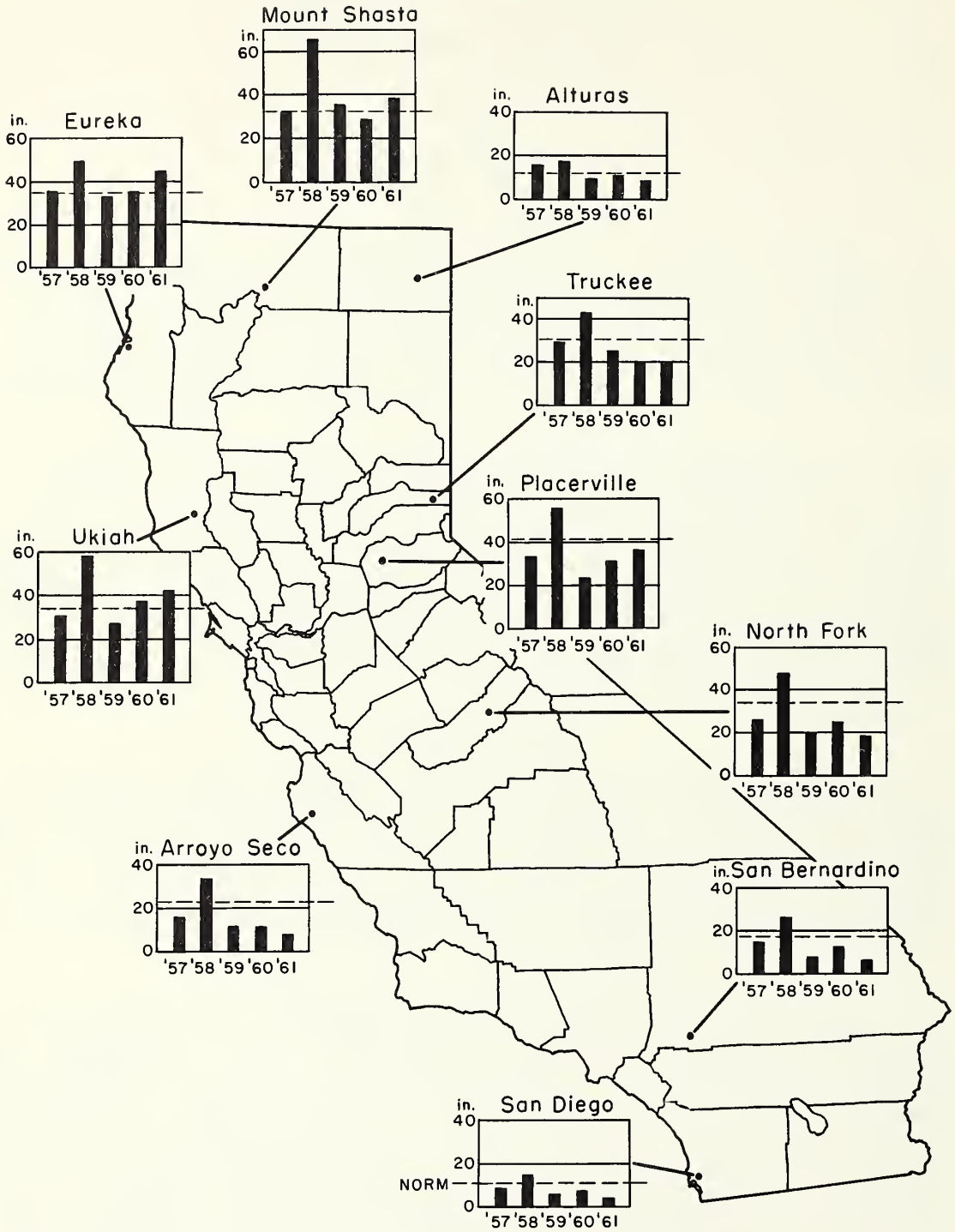

Figure 1.--Annual precipitation for a five-year period in 10 selected areas.

The warm pattern was broken temporarily in late July as the ridge moved off the coast, but it returned strongly again in August. Also in August, the moist tongue of air which normally extends from the Gulf of Mexico across the Southwest this time of the year shifted westward, causing an unusually large number of lightning storms in California.

Another major change in the high-pressure upper-level flow pattern took place in September. The ridge in western North America was replaced by a low-pressure trough, and a ridge developed over the eastern Pacific. This smaller amplitude pattern with more zonal flow continued for the rest of the fire season. It allowed cool Pacific air masses to penetrate California, and lowered the temperature to near normal. The pattern allowed more frontal activity, particularly in northern and central California, and brought some precipitation to these areas. However, this pattern also allowed portions of the Pacific high pressure cell to break off and move into the Great Basin. High pressure in the Great Basin produces drying north to east winds in California, and dry winds recurred periodically throughout the fall months--around Labor Day, October 1, and November 6 and 13.

Fire Weather Severity

The relative severity of the fire weather for 1961 can be shown by the wildland fire danger rating system, which includes five basic indexes: (1) spread index, which measures how fast a fire will spread; (2) intensity index, which measures how hot a fire will burn; (3) ignition index, which measures the relative ignitability of fine forest fuels and thereby also indicates the spotting potential of a fire; (4) burning index, which combines the spread and intensity indexes to indicate the size of the potential control job for an individual fire; and (5) fire load index, which combines the ignition and burning indexes to indicate the magnitude of the total potential fire control job that may be expected by the fire control organization. The fire season severity for any desired period can be measured by cumulating the fire load index.

Ten representative areas were selected to show the fire season severity throughout California (fig. 2). The fire weather severity in nearly all fire danger rating areas exceeded average conditions, as it also did in 1960 (table 1). Only in northern California did the severity fall below conditions in 1960. In central and southern California, it exceeded the normal by a wide margin. In the 4-month period from June through September, some areas had almost twice the normal fire weather severity. The highest departure from normal appeared in the foothill area on the west side of the San Joaquin Valley which had a fire weather severity more than three times the average.

Peaks of extreme fire danger are reflected in the large fires and heavy damages in 1961. Major losses occurred during early July in the Mariposa fire danger rating area in central California. Four fires burned a total of about 110,000 acres when indexes peaked into the extreme ranges (fig. 3).

Figure 2.--Location of 10 representative areas used to rate seasonal fire weather severity.

Table 1.--California fire weather severity ratings, June 1 - Sept. 30, by 10 representative fire danger rating areas

Fire danger rating area		Ratio to normal		Actual severity		
Name	Number	1960	1961	Normal	1960	1961
Clear Lake - Berryessa	175	(1/)	2.10	1,130	(1/)	2,370
Eagle Lake	262	(1/)	1.64	1,800	(1/)	2,960
Mount Shasta	240	1.71	1.34	1,042	1,779	1,399
Pacific	335	1.97	1.83	912	1,797	1,671
San Diego	630	(1/)	1.73	852	(1/)	1,470
San Gabriel Mountains	655	1.86	1.76	1,218	2,263	2,140
Santa Lucia Range	560	1.32	1.44	1,509	1,997	2,175
Springville - Hot Springs	438	1.71	1.93	1,163	1,985	2,249
Westside San Joaquin Valley	547	(1/)	3.33	1,174	(1/)	3,910
Willow Creek	115	1.80	1.14	631	1,134	718

1/ Not available.

North of the Mariposa area, near the town of Copperopolis, the Highway 4 - #1 fire started on July 9. During the peak of unfavorable weather two days later, this fire blew up from 11,500 acres to 24,120 acres in a few hours. At the same time, the Harlow fire in the Mariposa area also "exploded" from 7,500 to 37,000 acres in one afternoon. Humidities of 11 and 12 percent and temperatures in the 100-110°F. range helped drop fuel moisture down to record lows of 2 and $2\frac{1}{2}$ percent. Under these conditions, dry fuels can easily be ignited and fires spread even faster owing to spotting because of low fuel moistures. The ignition index during this period rose to 94 (fig. 3).

Severe fire weather again hit California over the long Labor Day weekend. A portion of the Pacific high pressure cell swept east into the Great Basin and brought strong, dry north to east winds in California. The lower fuel moistures and high winds boosted the burning indexes (figs. 4, 5, 6). As the fire weather became more severe, so did fire damage. From August 31 to September 7, about 185,000 acres of wildland and a hundred structures were burned in 500 fires.

The final period of extreme fire weather during the 1961 season was the most damaging because many homes were destroyed. The low humidities, low fuel moisture, and high winds resulted in some of the highest fire danger indexes on record (table 2). In November the Bel-Air,

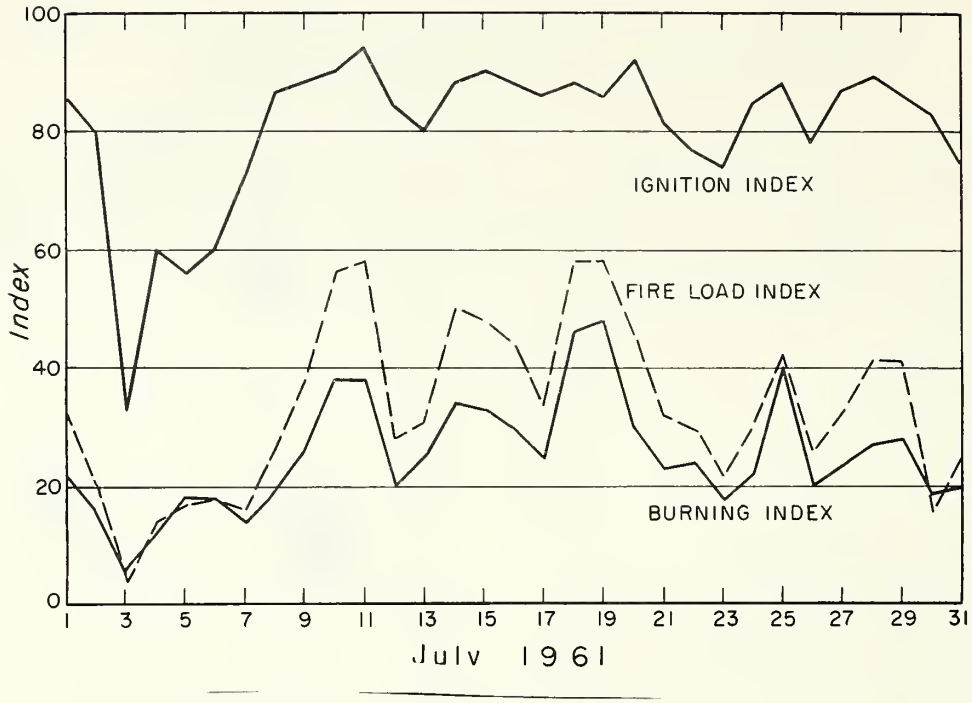

Figure 3.--Daily fire danger during July 1961 in the Mariposa fire rating area.

Brentwood, and Topanga fires raged across 14,800 acres in the Santa Monica Mountains and destroyed 456 structures. The heavy losses were attributed to fire behavior, poor home location, and brush fuel accumulations next to buildings.

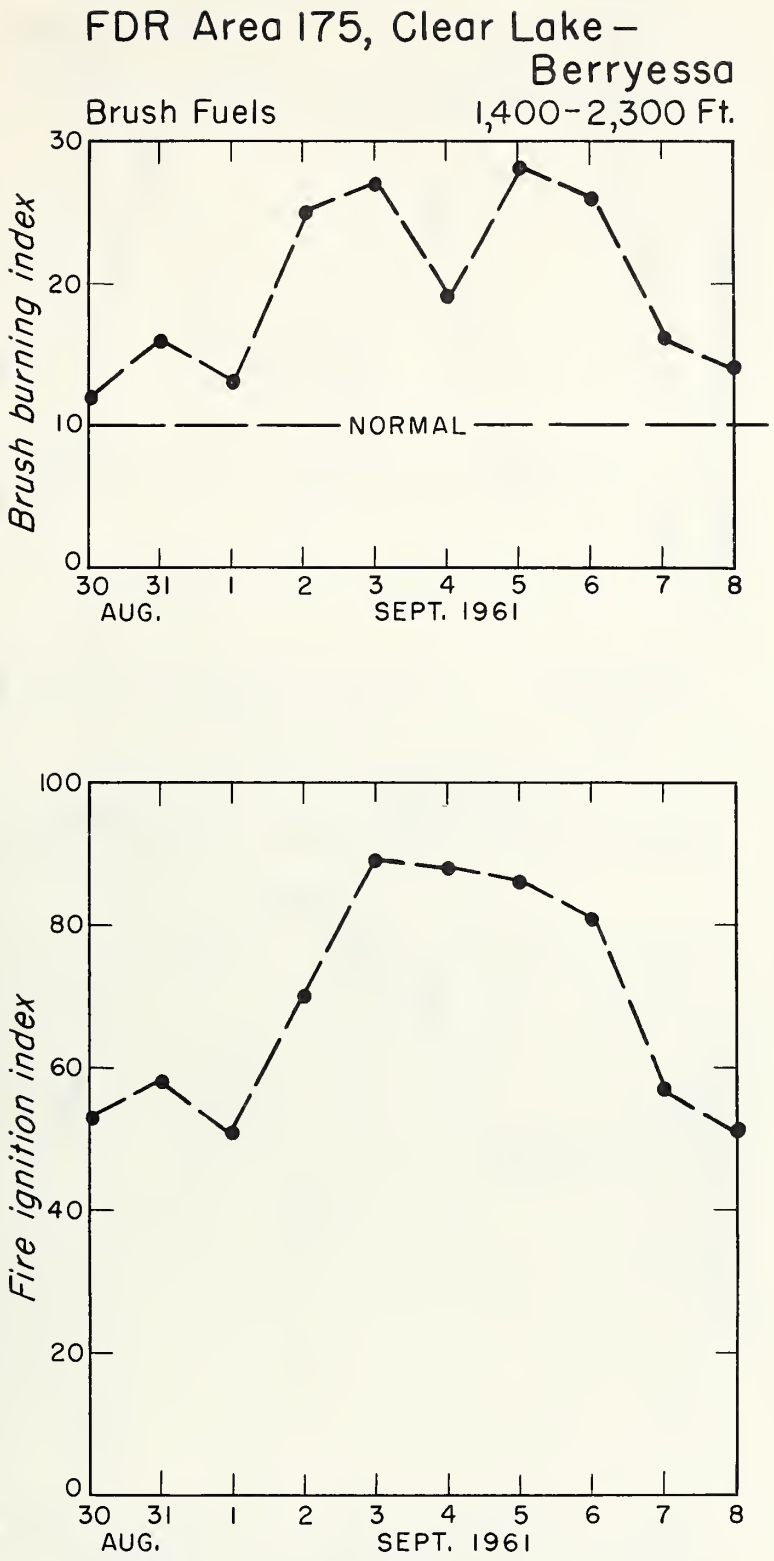

Figure 4.--Peak fire danger during Labor Day weekend.

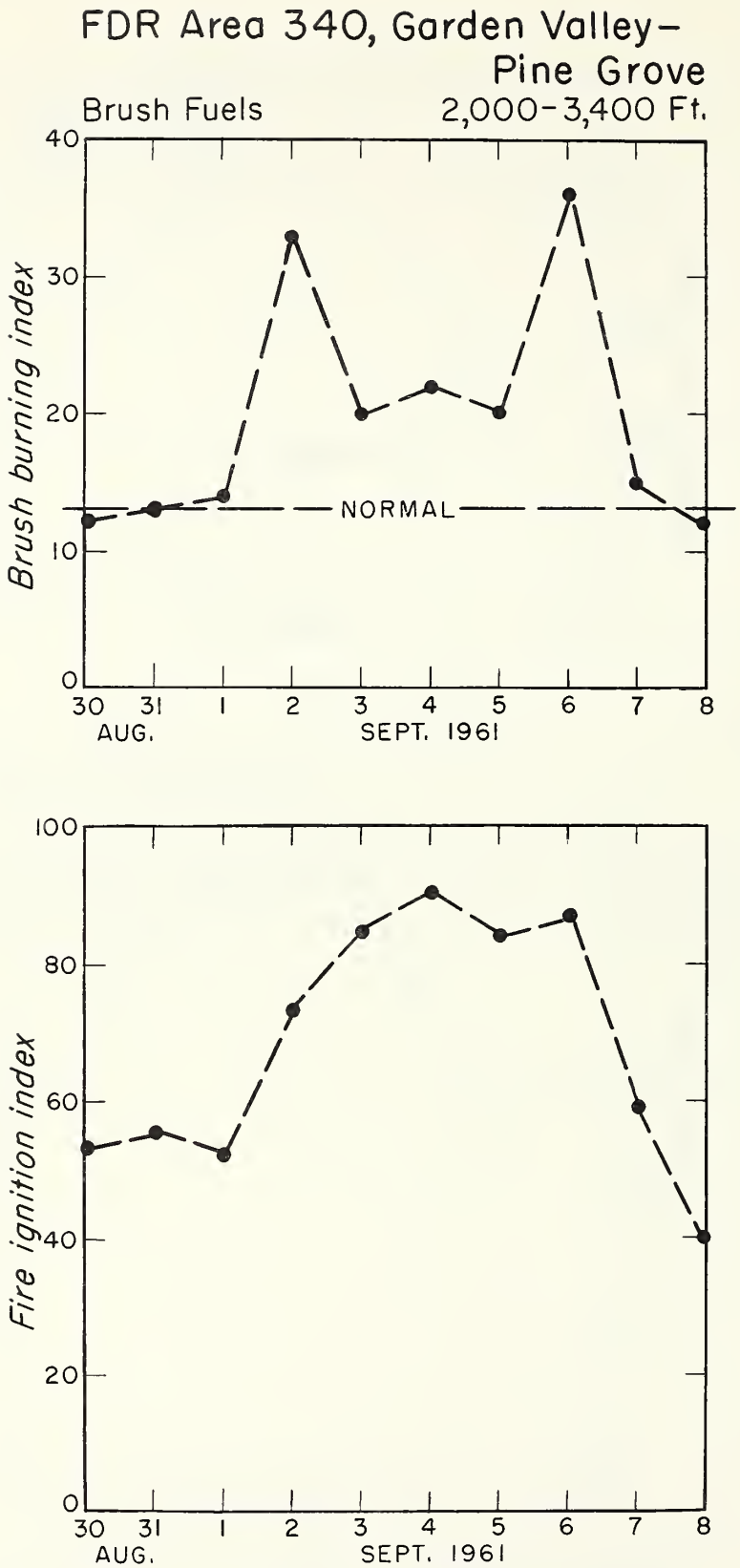

Figure 5.--Peak fire danger during Labor Day weekend.

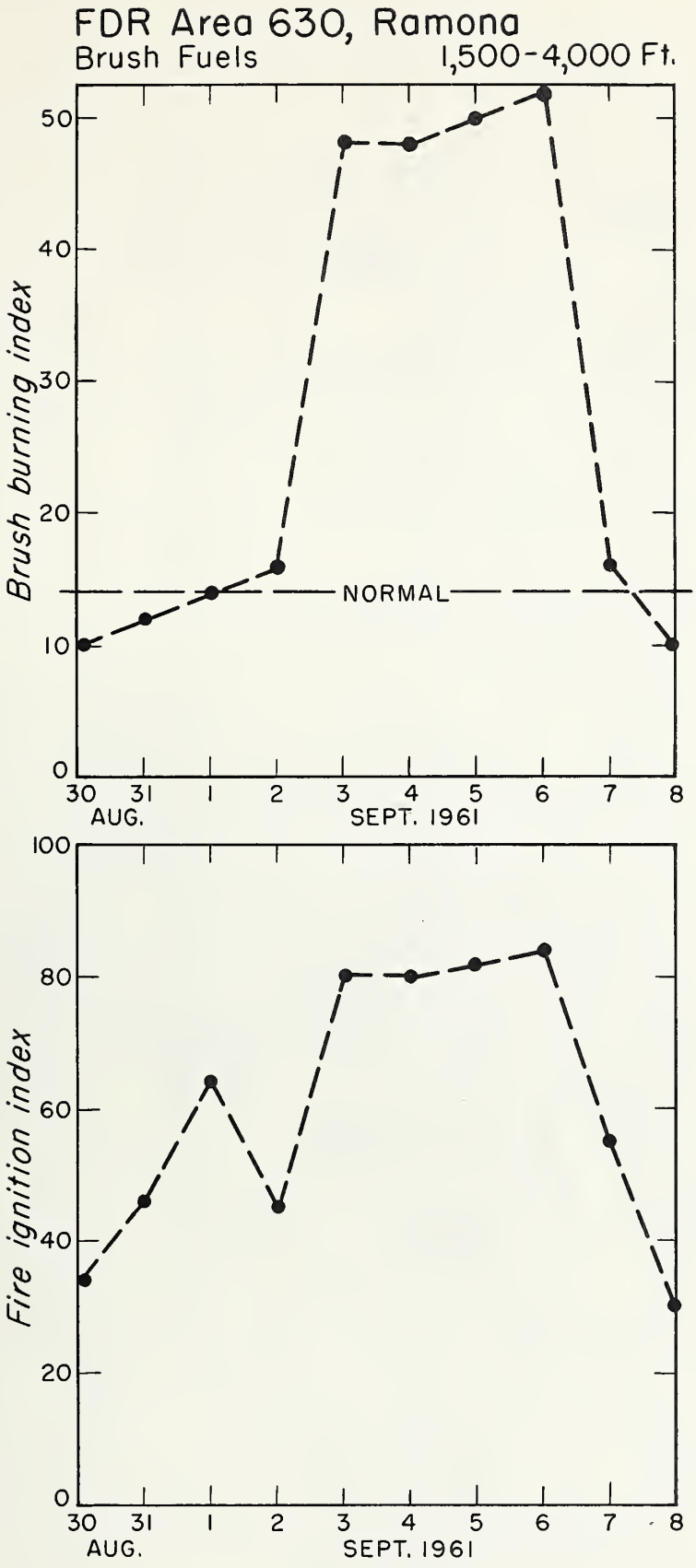

Figure 6.--Peak fire danger during Labor Day weekend.

Table 2.--Weather conditions at 2 p.m., November 6, 1961, and fire indexes, by selected stations in southern California

Station	Temperature	Relative humidity	Fuel moisture	Wind speed	Burning index	Ignition index	Fire load index
	Degrees F.	Percent	Percent	M.p.h.			
Burbank	81	5	1.5	23	96	95	100
El Toro Marine Base	79	12	2.5	25	99	88	100
Ontario	76	10	3.0	40	95	88	100
Point Mugu	88	4	1.5	23	96	95	100
San Diego	81	9	1.5	10	37	95	60
Santa Barbara	78	11	3.0	17	58	88	80